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ABSTRACT

The concept of cooperative goal structuring was examined, along with the effect of one cooperative learning technique (group consensus examinations) on the perceptions and achievement of college students. Cooperative goal structure exists when students perceive that they can obtain their goal only if the other students with whom they work also obtain their goals. The group consensus examination was chosen because of its effect in stimulating discussion and depth of processing. The sample consisted of 93 University of Kentucky students enrolled in an allied health colloquium representing the fields of community health, medical technology, physical therapy, physician assistant, and allied health education teacher training. Students were divided into 12 interdisciplinary groups and were trained in the group consensus decision-making mode by participating in the "Winter Survival Exercise" (Johnson and Johnson, 1975). Results indicated that when compared with the traditional (individual) mode of testing, group consensus examinations had a significant positive effect on the perceptions of students regarding the clarity and importance of course topics. Achievement on the unit quizzes was higher, and although no difference was found between the two treatment groups on final examination scores, student performance was superior to that of previous years. The eight training topics were: group development, problem solving, communication, ethics, handicapped, patient problems, aging and death, and legal problems. (SW)

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Cooperative Learning in Interdisciplinary Education for the Allied Health Professions ©

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ABSTRACT

The need for interdisciplinary education in allied health has often been cited, but few studies concerning appropriate learning strategies in such courses have been made. The purpose of this study was to examine the concept of cooperative goal structuring and to assess the effect of one cooperative learning technique (group consensus examinations) on the perceptions and achievement of allied health students in an interdisciplinary course.

The results indicated that when compared with the traditional (individual) mode of testing, group consensus examinations had a significant positive effect on the perceptions of students regarding the clarity and importance of course topics. Achievement on the unit quizzes was higher and although no difference was found between the two treatment groups on final examination scores, student performance was superior to that of previous years. A large majority of students indicated they preferred group consensus examinations in this type of course.

INTRODUCTION

In a previous article, some of the deterrents to effective team building in health care were described, and the suggestion made that interdisciplinary education would provide a means of early socialization to the team concept.[1] This paper examines strategies to be used in interdisciplinary courses in order to assure that students experience group problem solving and learn to deal with the conflicts such activity produces.

COOPERATIVE LEARNING: DESCRIPTION AND LITERATURE REVIEW

Merely placing students of different disciplines in classes together to study the same topic does not teach them how to work together. Positive goal interdependence must be created. Deutsch[2] and Johnson and Johnson[3] have described three goal structures: cooperative (positive goal interdependence), competitive (negative goal interdependence) and individualistic (no goal interdependence). A cooperative goal structure exists when the students perceive that they can obtain their goal if, and only if, the other students with whom they work obtain their goals. A competitive goal structure exists when students perceive that they can obtain their goals if, and only if, the students with whom they are linked fail to obtain their goals. An individualistic goal structure exists when the achievement of students' goals is unrelated to that of other students. The individualistic goal may be illustrated by criterion-referenced or mastery grading.

Positive goal interdependence may be created in a variety of ways. Sharan and Sharan[4] describe two main types of cooperative learning: Peer Tutoring and Group Investigation. The former includes Aronson, Stephan, Sikes, Blaney and Snapp's[5] Jigsaw technique, DeVries and Edwards'[6] Teams-Games-Tournament (TGT) and Slavin's[7] Student Teams

and Achievement Divisions (STAD). The latter, according to Sharan, includes his own Small-Group Teaching Method and the Johnsons'[3] Cooperative Learning approach.

The Jigsaw method, as the name implies, involves dividing the material to be learned into as many parts as there are group members. Each student learns only part of the material and is then responsible for teaching his part to his groupmates. However, each group member is responsible for learning all of the curriculum material for testing.[8] A variation of this technique is used to create interdependence in problem solving where each group member is in possession of part of the information needed to solve the problem or puzzle as in an interdisciplinary case study involving multiple patient problems.

Slavin[7] describes an interesting modification of the Jigsaw technique which he terms Jigsaw II. In this variation, students all read the same material but focus on separate topics. The students from different teams who have the same topics meet to discuss their topics and then return to teach them to their teammates. Such an activity would appear to have valuable applications to health professions education, with the inter-group discussions focusing along discipline lines.

Sharan[9] makes the point that "students accustomed to years of individual competition for grades are not likely to engage in mutual assistance without being helped by means of specific classroom social structures for promoting peer assistance." This statement has definite implications for health care professions students who have also competed viciously for appointments to professional schools. Nelson and Kagan[10] have observed that the tendency for children in the United States to compete often interferes with their capacity for adaptive cooperative problem solving. [In Soviet classrooms, on the other hand, cooperation between children is stressed; competition exists only between groups,

not individuals. Through such a system, children learn to work together and help one another.[11] It is reasonable to assume (unless resocialization to positive attitudes toward collaboration occurs) that the American child's tendency to compete will carry over into adulthood.

The model which seems most appropriate for interdisciplinary education for health care professions students is the Group-Investigation model. This model involves cooperative group inquiry and incorporates data gathering, interpretation of information and synthesis of individual contributions into a group product. Students who have become more sophisticated in group inquiry may also participate in the planning of study topics and learning procedures, and in the pursuit of group projects involving problem solving.

A six step sequence for the advanced group-inquiry model has been proposed by Sharan[9]: (1) Selection by students of a specific sub-topic within a general problem area and organization into small, heterogeneous groups; (2) cooperative planning by students and teacher of specific learning procedures, tasks and goals; (3) implementation of plans and data collection from a wide variety of sources; (4) analysis and evaluation of information gathered, summary and preparation of report or presentation; (5) report or presentation to total group; and (6) evaluation (can include either individual or group assessment, or both).

Evaluation may be discussed in terms of both formative and summative evaluation. Since one of the main purposes of cooperative goal structuring is learning the interpersonal skills necessary for teamwork and group problem solving, Johnson and Johnson[3] point out that the group must monitor and analyze its own processes. In addition to the group process analysis, formative evaluation may be conducted on the content through the use of self-assessment examinations. Since each health care practitioner must be individually certified, individual testing cannot be

entirely abondoned, but group consensus examinations are a powerful tool to increase depth of processing and develop analytical skills. Group consensus exams are especially appropriate for formative evaluation. In this method, students first take the exam individually and then reach consensus on each answer. Each member receives the same score.

Deno and Kuehnle[12] have outlined a number of examination options which create interdependency, thus making students responsible for each other's performance. These may include situations where groups of students take the exam together (turning in one set of answers--the group consensus model described above), or as individuals (with individual scores averaged for a group score). The latter method places more responsibility on each individual and helps prevent situations where one group member depends on the group to carry him. Various combinations of these two options may also be used.

The cooperative learning strategies which have already been described are applicable to any content. They seem to be particularly effective for high cognitive level outcomes such as identifying concepts, analysis of problems, judgment and evaluation.[7] It is not necessary to add a new or separate course to the already overstuffed curriculum in order to provide students with the training and experience of working in groups. The cooperative learning format has been successfully used in college courses in algebra, geometry and calculus[13], social psychology[14, 15], psychology[16] and allied health[17].

Much anxiety may be created in students who are inexperienced in interdisciplinary inquiry or group problem solving. Faculty members, too, may be at a loss as to the type of learning strategies or teaching techniques to use in order to develop collaborative skills. In environments

where instructors are viewed as "experts" who transmit knowledge and demonstrate skills, students have little opportunity to develop their own resources, learn to interact effectively or deal with the anxieties that disagreements produce. In the traditional methods of education characterized solely by lectures, individual study and competition for grades, the collaborative skills of communication, trust, and conflict resolution are poorly nourished and may not reach fruition. Graduates, then, although extremely knowledgable and technically expert, are inadequately prepared for the world of work where they are required to interact with others and incorporate the contributions of others in making responsible decisions.

The use of cooperative goal structuring not only provides a more fertile environment for the development of interactive skills, but also has been shown to result in a number of other positive outcomes including: (1) a greater degree of successful mastery, retention and transfer of concepts, rules and principles; (2) increased ability to understand the perspectives of others; (3) more positive attitudes toward the subject matter; (4) more positive attitudes toward peers (including a greater degree of trust); (5) greater confidence in one's own ability; and (6) improved skills in leadership.[18,3]

Slavin[7] states that the research on cooperative learning justifies several conclusions. Those particularly significant for higher and adult education (especially in interdisciplinary health science courses) are summarized as follows: (1) For academic achievement, such techniques are no worse than traditional techniques and in most cases are significantly better. (2) For high level cognitive outcomes, cooperative techniques that involve high student autonomy may be more effective than traditional techniques. (3) Cooperative learning techniques have fairly

consistent positive effects on mutual concern among students regardless of the specific structures used.

The greatest benefits seem to accrue in cases where a positive goal interdependence is created, either through grading based on an average of the individual group members scores, group consensus, or by means of one joint project or paper.

Johnson and Johnson[19] state that the most effective method of group decision making is consensus. Consensus is defined as a collective opinion arrived at by a group of people working together under conditions that permit communication to be sufficiently open so that everyone in the group has a fair chance to influence the decision. When a decision is made, all members understand the decision and are prepared to support it. Decisions made by consensus are sometimes referred to as synergistic decisions because the group members working together arrive at a decision of higher quality than they would if each one worked separately. Differences of opinion are seen as a way of (1) gathering additional information, (2) clarifying issues and (3) forcing the group to seek better alternatives.

DESCRIPTION OF THE STUDY

The present study focused upon the use of group consensus examinations in an interdisciplinary course for Allied Health Professions students. The group consensus examination was chosen because of its effect in stimulating discussion and depth of processing, hopefully resulting in greater retention, ability to apply knowledge and in more positive perceptions of the course and its content.

Methods

Subjects. The sample consisted of 93 students enrolled in a required interdisciplinary course (Allied Health Colloquium) at the University of Kentucky in the fall semester of 1980. There were 39 junior and 52 senior professional students. There were 20 males and 73 females who ranged in age from 20 to 50, with the majority in their early twenties. Of the different allied health disciplines, there were 18 community health(CH) students, 20 medical technology(MT) students, 32 physical therapy(PT) students, 20 physician assistant(PA) students and 3 students enrolled in the allied health education(AHE) teacher-training program. Of these three, two had associate degrees in dental hygiene and one was a medical laboratory technician.

Assignment to Groups. Subjects were divided into twelve interdisciplinary groups by random selection. There were seven to eight students in each group and they remained in the same group throughout the semester. Subjects were trained in the group consensus decision making mode by participating in the "Winter Survival Exercise"[19]. One half of the twelve small groups (six) were assigned to the cooperative (group consensus) mode and one half to the individual mode. To control for facilitator effect, conditions were rotated in the middle of the study. Thus, even numbered groups were assigned to the group consensus mode for Units I-IV and to the individual mode for Units V-VII. Odd numbered groups took the quizzes individually for Units I-IV and as a group for Units V - VII. Subjects were told they would be helping to investigate the possibility of using group consensus exams for future classes and informed of the plan at the beginning of the semester.

All other aspects of the course were identical for all groups. A detailed syllabus and facilitator's manual were prepared to assure uniformity.

Faculty Facilitators. Each group was randomly assigned to a faculty

facilitator who was assigned to this course by his or her department. All were members of the College of Allied Health Professions faculty. These facilitators attended a seven hour training session conducted by the author in which the "Definitions" and "Teacher's Role" session of the Johnsons' Learning Together and Alone[3] workshop were presented and the course activities and requirements were discussed.

Variables

The independent variable involved the method of administering the unit quizzes and conditions are described as follows:

Treatment 1. Cooperative (Group Consensus) Mode: Students were instructed to first complete the quiz alone, then discuss each item with the other members of the small group and select one answer through decision by consensus. They were instructed: "There will be one set of answers from the entire group. Each member will receive the same grade, and must indicate that he or she agrees with the answers by signing the group's answer sheet. Make sure all members have their say. Assist all group members in understanding the material, as you will be tested individually at the end of the course. Express your ideas and don't change your mind unless persuaded by logic or information to do so."

Treatment 2. Individual Mode: Students took the unit quizzes in the traditional manner of testing, alone, with no discussion or interaction. Each student received a different grade based on his own performance.

Student perceptions were assessed by an eight-item Unit Evaluation anchored to a seven-point Likert-type scale. Reliability of this instrument was 0.79 (Cronbach's alpha). This instrument was administered immediately following the quiz over each unit. Scores for all items were summed to give an overall score with 56 possible points.

These scores represented a global measure of student perceptions regarding the clarity, understanding and importance or utility of the concepts studied in the various units.

Achievement was measured by: (a) unit quizzes based on the objectives for each unit. These consisted of ten items except for Unit V which contained eight items and (b) a 50-item multiple choice final examination based on the objectives and content, with items parallel to those in the unit quizzes. Scores were partitioned by units and recombined for the two different treatment groups.

In addition to the statistical analyses, attitudes toward group consensus examinations were elicited by three items appended to the final examination and by comments accompanying the course evaluation form.

Data Analysis. A t test for differences between means of independent samples was applied to the scores on the Unit Evaluation forms in order to test the hypothesis that participating in group consensus exams would result in different perceptions regarding the course. Separate analyses were run for each of the eight units.

A t test for differences between means of two independent samples was applied to the scores on the unit quizzes for each of the eight units. A t test for differences between means of two independent samples was also applied to partitioned scores on the final examination which represented each treatment.

Results

A significant difference at less than the 0.05 level was found between students' perceptions regarding the clarity, understanding and importance or utility of the unit topics in the groups taking quizzes in the group consensus mode when compared with those taking

quizzes individually for six of the eight units. The results are shown in Table 1.

Group quiz mode scores were considerably higher in all cases but one (Table 2). Differences were statistically significant at the 0.05 level in four of the eight cases.

There was no significant difference between final examination scores for students who took unit quizzes in the group consensus mode and those who took them individually (Table 3).

In addition to the statistical comparison of the effects of the group consensus vs. individual quizzes on perceptions and achievement, an attempt was made to assess student attitudes toward the idea of group consensus examinations. Results are shown in Table 4. An examination of these data show that allied health students indicated preference for group consensus examinations over individual examinations.

DISCUSSION

Since perceptions of the unit topics were more positive in seven of the eight units in the groups taking the quizzes in the group consensus mode, one might conclude that this cooperative technique of positive goal interdependent structuring resulted in greater understanding and more positive attitudes, at least for these topics and this group of students. These findings support those of previous investigators.

Of the two units where no significant difference was found, one may wish to examine them for characteristics which could contribute to different results. Unit IV, on ethical considerations, was the only unit which showed more positive (although not significantly different) perceptions in the individual quiz mode group than in the group

Table 1

Scale Scores of Student Perceptions Regarding Unit Topics

	Group Consensus			Individual					
	N	Mean	SD	N	Mean	SD	D	t	p
1. Group Development	44	45.5	4.5	21	37.7	5.7	7.8	-5.8	.0001
2. Problem Solving	45	45.6	4.4	36	39.0	5.2	6.6	-6.6	.0001
3. Communication	37	46.9	3.9	27	39.5	5.0	7.4	-4.8	.0001
4. Ethics	45	44.0	6.9	27	44.4	6.5	0.4	0.6	.5568
5. Handicapped	29	48.7	5.3	32	46.0	6.2	2.7	-2.1	.0538
6. Patient Problems	25	47.4	4.5	38	40.5	5.7	6.9	-4.7	.0001
7. Aging and Death	28	47.0	5.0	43	41.1	6.4	5.9	-5.1	.0001
8. Legal Problems	28	46.3	5.0	26	38.6	6.5	7.7	-4.3	.0002

Table 2

Unit Quiz Scores*

	Group Consensus		Individual				
Unit	Mean	SD	Mean	SD	D	t	p
I	83.8	12.9	70.0	18.3	13.8	2.00	<.05
II	93.2	4.7	80.2	12.7	13.0	3.62	<.001
III	93.5	7.4	82.3	12.7	11.2	1.08	>.10 <.15
IV	96.8	4.7	76.4	15.3	20.4	1.80	<.05
V	83.6	15.9	86.6	13.6	-3.0	-.20	>.40
VI	88.2	2.4	83.5	12.7	4.7	.37	>.35
VII	83.5	10.3	68.2	14.7	15.3	1.91	<.05
VIII	82.2	14.2	66.3	15.7	15.9	1.06	>.10 <.15

*Percent of correct answers

Table 3

Comparison of Final Examination Scores*

	Group Consensus N = 44		Individual N = 44				
Content	Mean	SD	Mean	SD	D	t	p
Units I-IV	20.76	1.72	21.52	1.76	-.76	-.44	> .30
Units V-VIII	18.77	1.90	18.98	1.80	-.21	-.11	> .45
Totals	39.53		40.50		-.97		

*Number of correct responses

Table 4

Responses Concerning Group Consensus Examinations

Option	N	Percent
If I had my choice, I would prefer to take		
a. all quizzes as a group, final as individual.	0	0
b. both final and quizzes as a group.	64	84.2
c. both final and quizzes individually.	2	2.6
d. quizzes individually, final as a group.	0	0
e. a mixture (some individual, some as a group.	9	13.2
The method in which the quizzes and exams were administered influenced by attitude toward the course		
a. positively when in group mode, negatively in individual.	40	51.3
b. positively in group, no influence in individual	27	34.6
c. negatively in group, positively in individual	2	2.6
d. no influence in group, negatively in individual	0	0
e. no influence either way.	9	11.5
"The cooperative quizzes helped me learn the content."		
a. not at all descriptive	7	9
b. descriptive to a small extent	5	7
c. descriptive to a moderate extent	13	17
d. descriptive to a large extent	20	26
e. descriptive to a very large extent	31	41

consensus group. Since this unit dealt with a topic fraught with highly personal values, it may be that attempting to reach group consensus served to confound and confuse the students rather than enlighten them. Such topics should probably be given more time than was allowed. It may also be noted that the scores on this unit showed the highest standard deviation, indicating a wider variance of opinion which might be expected for this type of content and which would affect the results.

Unit V, Communication with the Handicapped, involved a panel presentation by several individuals who are themselves handicapped. They proved to be very dynamic speakers and this unit was well received by all students. As may be noted in Table 1, statements regarding the clarity, understanding and utility of the concepts presented received the highest degree of agreement responses of all eight units. Perhaps a ceiling effect prevented the emergence of differences between the two groups. The difference between the two treatment groups was still obvious, and the probability of such a difference occurring by chance alone was .0538.

Whether the opinions expressed by the students on the agreement-disagreement scale reflect an attitude toward the unit topic or the situation may be difficult to assess. Rokeach[20] describes four possible determinants of a change in opinion resulting from various combinations of attitude-toward-object and attitude-toward-situation.

Festinger[21] and Cohen[22] have questioned the relationship between attitude and opinion. In consideration of these doubts, one hesitates to say that the treatment caused a difference in attitudes, but one can conclude that students who took quizzes in the group consensus mode indicated a greater degree of clarity and understanding of the topic and agreed to a greater extent that the concepts were important than did those taking the quizzes in the individual mode.

Group consensus quiz score means were higher than the means of quizzes taken individually in all cases but one, although differences were statistically significant at the .05 level in only four of eight cases. The high variation in these scores could account for the lack of statistical significance in the differences.

Of course, group consensus answers represent a pooling of information and ideas and one would expect the scores to be higher, but this data supports the contention that group problem solving is superior to that of individuals. That there is not a greater difference in the scores perhaps reflects the unfamiliarity of the students with the group consensus type of examination, their inexperience with group problem solving, and the short period of time they had for developing group cohesiveness.

The two treatments produced very little difference in the final examination scores representing material tested in unit quizzes by the two different modes. Although uncontrolled influences may have affected these results, this could suggest that group consensus exams alone may not account for differences in achievement found by some other investigators between cooperative and individual learning groups and is in agreement with previous findings that achievement in cooperative learning groups is, at least, never any worse than in traditional classrooms. A statistical comparison was not made, but cursory observation indicated that examination scores were generally higher than those of students enrolled in Colloquium in previous years.

The results shown in Table 4 revealed that, in this situation at least, a large majority of students preferred group consensus examinations to the traditional individual mode, felt that the experience had a positive influence on their attitudes and helped them learn the content. Typical comments included:

"More discussion provided a better learning experience."

"It fits with the teamwork concept."

"It exposes us to different backgrounds, function, and values."

"It is more time consuming--but a constructive use of time. I learned more this way."

"It helped to get to know each other."

"The team concept is an effective and superior method of dealing with problems."

"It is a chance to practice group skills on something (quizzes) we had a stake in."

"It allowed us to read the questions more closely--by ourselves we often read them wrong."

"It helped certain people understand terminology they didn't understand."

SUMMARY AND RECOMMENDATIONS

Students in the group consensus quiz mode indicated more positive perceptions regarding the clarity, understanding, and importance or utility of seven of the eight unit topics. Six of these differences were statistically significant at the 0.01 level and the probability of a seventh difference occurring by chance alone was 0.0538.

Group consensus quiz score means were higher than those of individual exams in all cases but one.

There was no significant difference between the two treatment groups in achievement as measured by the final examination.

A large majority of students preferred the group consensus examination to individual testing and felt it was more compatible with the philosophy of interdisciplinary team training.

As a result of this study, the following recommendations are proposed:

1. The study of the effects on achievement should be repeated with additional populations, using better control of the interfering variables, and making some assessment of retention over time.
2. Cooperative learning strategies should be used in interdisciplinary education for the health related professions.
3. Group consensus examinations should be implemented in interdisciplinary courses as one way of creating positive goal interdependence in team problem solving.

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